Brazilian Portuguese noun phrases: An optimality theoretic perspective[*]

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Abstract

In this paper we examine the nominal system in Brazilian Portuguese (BrP), a challenge to cross-linguistic studies which rely on the generalization that a language that has indefinites should not have bare nouns. BrP has bare singulars, bare plurals, singular and plural indefinites. We examine the behavior of these phrases, mostly in object position of episodic predicates, and propose that each has a different semantics. The nominal system of BrP can be successfully explained, we argue, within the bi-directional Optimality Theory (biOT) theoretical framework developed by Hendriks et al. (2010). This approach allows us to describe and explain patterns of competition, and accounts for language variation by constraint reranking. For BrP, we propose the synchronic coexistence of two grammars: bare plurals appear in the formal variety of BrP that maintains plural agreement, and bare singulars appear in informal spoken BrP, along with plural definites and indefinites that lack plural agreement on the noun. Under this analysis, BPs denote inclusive plurals, while BSs get a non-atomic semantics that covers both mass and plural interpretations.

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1. Noun phrases in Brazilian Portuguese

The nominal system in contemporary Brazilian Portuguese (BrP) is a challenge, because it seems to run against the generalization that languages have either indefinite noun phrases or bare nouns. The verbal phrases from (1) to (3) show the possible fulfillments of the object position of an episodic predicate, *comprou* ('bought'). Besides definite singulars and plurals in (1), BrP uses singular and plural indefinite phrases in this environment (2), as well as bare noun phrases (3):

(1) a. compr-ou *o* *livro*
buy-PERF.PS ART.DEF book
'bought the book.'
b. compr-ou *o-s* *livro-(s)*.
buy-PERF.PS ART.DEF-PL book-(PL)
'bought the books.'

(2) a. compr-ou *um* *livro*.
buy-PERF.PS ART.IND book
'bought a book.'
b. compr-ou *un-s* *livro(s)*.
buy-PERF.PS ART.IND-PL book-(PL)
'bought some books.'

(3) a. compr-ou *livro*.[1]
buy-PERF.PS book
b. compr-ou *livro-s*.
buy-PERF.PS book-PL
'bought books.'

The coexistence of a bare singular (BS) in (3a) and a bare plural (BP) (3b) with full indefinite singulars (2a) and plurals (2b) in the grammar of BrP led Schmitt & Munn (1999) to challenge the nominal parameter proposed by Chierchia (1998). Cross-linguistically, bare nominals and full DPs with articles are in complementary distribution. Languages that lack definite and indefinite articles (such as Mandarin Chinese) productively use bare nominals with definite and indefinite interpretations. English has definite articles, and an indefinite singular article, which leaves it with productive bare plurals and bare mass nouns, but they are confined to an indefinite

[1] We will not translate the Bare Singular sentences in order to avoid misinterpretations in English.

interpretation. Bare singulars occur only in very restricted contexts. We observe further restrictions in Romance languages: Spanish and Italian limit bare plurals to post-verbal ('governed') positions (Longobardi 1994), and French does not allow bare nominals at all in regular argument positions. Rather surprisingly, BrP does not pattern with the other Romance languages, because all possibilities are productive: bare singulars, bare plurals and singular/plural definites and indefinites appear in subject and object position.

There are various ways to deal with the data in (3) in current linguistic theory, and it is not our aim to review these different theories. However, it is important to show that the data in (1)-(3) cannot be explained as the result of a null D(eterminer). Cyrino and Espinal (2015) claim that BrP is no different from other Romance languages. It behaves just like French, with the only difference that BrP has a productive null D, whereas French does not. The null D analysis is grounded in Longobardi's (1994) assumption that a DP structure is needed for argumenthood, so articles appear on nominals that appear in regular argument position, where they refer to an entity that saturates the predicate. Given that the bare nominals in (3) do so, Cyrino & Espinal (2015) take them to project a DP. Longobardi requires the null D to be licensed by a governed argument positions (postverbal subjects and objects). This restriction is lifted by Cyrino & Espinal to accommodate bare nominals in subject/preverbal position as exemplified in (4) (Munn & Schmitt 2005):

(4) *Criança* lê revistinha.
child read.PRES.3SG comic-book
'Children read comic books.'

The wider distribution of null Ds in BrP makes it difficult to reconcile Cyrino & Espinal's proposal with Chierchia's (1998) blocking principle, which only allows covert type-shifting for meanings not expressed overtly by determiners. Given the overtly available definite and indefinite articles in (1) and (2), a null D with the same meaning should be blocked. This is exactly why Schmitt & Munn (1999, 2005) point to BrP as a language that does not easily fit Chierchia's (1998) typology. We conclude that the null D analysis advanced by Cyrino & Espinal (2015) restores the normalcy of BrP within the family of Romance languages, but does not explain the distribution of labor between the alleged null Ds in (3) and their overt counterparts in (1) and (2). We make the contrasts in (1)-(3) the focus of our paper.

We do not assume a null D, but take the bare nominals in (3) to project an NP or a NumP, and shift to a type *e* denotation by means of a covert type-shift, as proposed by Chierchia (1998), and implemented for BrP by Pires de Oliveira & Rothstein (2011). The covert type-shift must be motivated by lack of an overt determiner with the same meaning. The competition-based approach of bidirectional Optimality Theory (biOT) lends itself well to an

exploration of the covert type-shifts that are available for the bare nominals, as compared to the overt type-shifts encoded in the article system and plural morphology, because it offers a formal account of blocking. So this paper exploits the biOT system developed in Hendriks et al. (2010) to explain the contemporary Brazilian Portuguese nominal system exemplified in (1)-(3).

A number of theoretical issues are raised by the claim that the noun phrases in (3) are in regular argument position, and qualify as type *e* denoting expressions, i.e. denoting individuals (and not predicates). However, it is not our aim to deal with all of them in this paper. In particular, generic sentences like (4) raise issues that are beyond its scope (but see the conclusion for some discussion). This paper focuses on what makes the bare phrases in the object position of an episodic predicate in (3) different from the full DP nominals in (1) and (2), and on how it is possible to find this full range of form-meaning combinations in contemporary BrP. We shall argue that (3a) and (3b) belong to different varieties of BrP, each with their own grammar. Thus, the BS and the BP are not in direct competition.

This paper is organized as follows. Section 2 relies on de Swart & Zwarts (2010) to develop the basic OT model that derives the forms and meanings in (1) and (2). Section 3 dives deeper into the issue of plurality in biOT, following Farkas & de Swart (2010) in order to clarify the semantics of the BS and the BP. Section 4 brings the different insights together in a biOT analysis that captures the form-meaning combinations in (1)-(3), by arguing that they belong to different grammars. Section 5 works out the implications of the biOT grammar for the semantics of bare plurals and bare singulars in BrP. Section 6 concludes.

2. First steps towards an optimality theoretic grammar of BrP nominals

2.1 The semantics of nominals in bidirectional OT

Optimality Theory, as originally proposed by Prince and Smolensky (1997), is a theory that defines well-formedness in terms of optimization over a set of output candidates for a particular input. The bidirectional version of OT in Hendriks *et al.* (2010) explains the syntax-semantics interface by combining the two directions of generation and interpretation involved in conversation. Both are guided by an optimization process: the speaker chooses the optimal form for what she intends to communicate, and the hearer attributes the optimal interpretation to a given form. These choices are driven by rules that are universally available. However, these rules are violable, and may be overruled. Cross-linguistic variation at the syntax-semantics interface is then explained by the different rankings of these universal rules, fixing the optimal form-meaning pair for each language. The universal rules are built from two opposing forces: economy and expressivity. The principle of economy dictates that in all languages the nominal system should be bare, as in

Karitiana (Müller & Bertucci 2012) and Mandarin Chinese (de Swart & Zwarts 2010): roughly, one form is enough to express many meanings, because it is the most economical way for speakers to express themselves.[2] This principle is captured by the markedness constraint *FUNCTN, which punishes all functional structure that adorns the N:

> *FUNCTN: Avoid functional structure in the nominal domain.

The other force driving languages is the expression of meaning, which pushes in the opposite direction from economy. Ideally, expressiveness dictates that each meaning should be expressed by one single form. Logical languages may be an example of this rule. In the nominal domain, expressiveness of meaning drives the process of grammaticalization: particular forms are invested with particular meanings. The introduction of a morpheme in the nominal domain in a language that only has bare nouns reshapes the whole system. Suppose a language in which the only contrast in the nominal domain is between bareness and the plural form. In order to account for this contrast, a faithfulness constraint is needed, one that requires the expression of plurality in the functional structure of the noun:

> FPL: Reference to a sum of individuals must be reflected in a special plural form of the nominal.

The constraints are ranked in an order of importance. Violations of lower ranked constraints are tolerated if such a pattern allows satisfaction of a higher ranked constraint. Thus, in Karitiana and in Mandarin Chinese, *FUNCTN is ranked above FPL (represented as *FUNCTN >> FPL), whereas in English and BrP, the existence of specialized plural morphology in *os livros* (1b) vs. *o livro* (1a) indicates that FPL is ranked above *FUNCTN (FPL >> *FUNCTN). Although the constraints are universal, their effect is not visible in all languages, for faithfulness constraints may be overruled by markedness constraints in particular grammars. Cross-linguistic variation is thus captured in terms of constraint reranking.

In OT, the expression of the definite article is driven by the faithfulness constraint FDEF:

> FDEF: Reference to discourse unique individuals (unique/maximal or familiar ones) requires the use of an expression of definiteness.

The constraint relies on the well-accepted semantics of the definite description. It states that the sentences in (1) require uniqueness/familiarity,

[2] This is a naïve description of Mandarin Chinese since this language has a system of classifiers. Karitiana seems to be the best example of an economical language in the domain of nominal expressions under consideration in this paper.

that is, there is a particular book or group of books already introduced in the discourse or otherwise contextually identified as a unique entity or maximal set of entities.

In bidirectional OT, the presence of specific forms with specific meanings has implications for the interpretation of bare nominals, as the specific meaning is blocked for the bare nominal. Bidirectional OT is thus a formal implementation of Chierchia's (1998) blocking principle. Under bidirectional interpretation, unmarked nominals in Karitiana or Mandarin Chinese can get a singular/plural/mass interpretation, referring to atoms or sums or the entire lattice, and also definite and indefinite interpretations in the right contexts, because these languages do not have number morphology, nor articles. We refer the reader to de Swart & Zwarts (2010) for details on these articleless languages, and focus here on languages with articles, like BrP.

The introduction of a definite article into the grammar of English and BrP restricts the interpretation of the bare nominal to an indefinite interpretation. Tableau I illustrates how a definite interpretation is blocked for the English bare mass nouns (*water, flour*) and bare plurals (*apples, children*) in biOT:

	<form, meaning>	**F-INT**	FDEF	FPL	*FUNCTN
(i)	<apples,$\exists x_{sum}$> ✌				*
(ii)	<apples, τx_{sum} >		*		*
(iii)	<the apples, $\exists x_{sum}$ >	*			**
(iv)	<the apples, τx_{sum} > ✌				**

Tableau I: bidirectional OT tableau of the definite/indefinite contrast in English

The biOT Tableau I evaluates the form-meaning combinations in the second column on the basis of four constraints. Constraint violations are indicated by an asterisk (*). FPL is a syntactic constraint that requires the expression of sum reference. We will discuss the role of plurality in Section 3, below, so Tableau I only shows candidates that satisfy this constraint. The left-right order of the constraints in the tableau indicates their strength. The semantic constraint F-INT occurs at the far left end of the tableau, where it is highest in the ranking. F-INT ('interpret faithfully') is a semantic constraint proposed by Zeevat (2001), which states that morphemes and lexical items have meanings, and the hearer has to faithfully take these meanings into account in the interpretation process. In Tableau I, F-INT requires the interpretation of the definite article in terms of definiteness. In the absence of a definite article in the form, F-INT is trivially satisfied by candidates (i) and (ii). F-INT is respected by candidate (iv), but violated by candidate (iii), in which the definite article is not interpreted as contributing iota. Thus the existential interpretation of the definite plural in (iii) is blocked, because

there is a better interpretation for this form in terms of uniqueness/ maximality in (iv).

FDEF is a syntactic constraint that requires the expression of definiteness. FDEF is trivially satisfied by candidates (i) and (iii), which convey an indefinite meaning. FDEF is violated by candidate (ii), because the iota meaning is not conveyed by the bare nominal.

Form-meaning pairs do not need to be perfect (i.e. incur no violations), as indicated by the fact that the definite plural in (iv) incurs two violations of *FUNCTN: one for the definite article, and one for the plural morphology on the noun. These violations are accepted, because the alternative in (ii) would incur a violation of FDEF, a constraint that is ranked higher than *FUNCTN in the grammar of English. Thus, bidirectional optimization selects as optimal the pairs that have the best form (compared to alternative forms) for the given meaning, and the best meanings (compared to alternative meanings) for the given form.

The four candidates spelled out in Tableau I help to understand how the semantics of the bare nominal in English is calculated under bidirectional OT. Uniqueness/familiarity is not available for the bare plural in (ii), because definiteness must be expressed in D in languages with a high ranking for FDEF. So the form-meaning pair in (ii) loses against its competitor in (iv). There is no constraint targeting the expression of indefiniteness in Tableau I, so the least marked and most economical form in (i) gets the existential meaning that is not available for the explicit form (iii). The bare plural thus has an existential interpretation, for lack of any other available interpretation. In this way, bidirectional OT formalizes the blocking principle that allows a covert ∃ type-shift for bare plurals in English.[3]

This blocking account immediately extends to BrP, where we see that the bare nominals *livro* and *livros* in (3a) and (3b) get a non-definite interpretation. In this way, we have captured the basic contrast between examples (1) and (3) as the contrast between overt definites, and covert (bare) indefinites.[4] We can now zoom in more closely on indefinites.

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[3] Chierchia (1998) would derive the existential interpretation through derived kind interpretation, but Krifka (2004) applies the covert type shift ∃ directly.

[4] We disagree here with Cyrino & Espinal (2015) who claim that BrP bare singulars can get definite as well as indefinite interpretations. (i) is one of their key examples:

(i) Eu limpei *banheiro* ontem. Deixei *ele* bem brilhante.
I cleaned bathroom yesterday. Left it well bright
'I cleaned the/a bathroom yesterday. I left it spotless.'

Cyrino & Espinal claim that the BS in (i) is a definite description, because we can refer to the same situation with the definite *o banheiro*. However, this might very well be the 'weak definite' we find in English *go to the store*, which alternates with

2.2 Discourse reference and argumenthood

The singular indefinite article in (2a) is primarily a marker of discourse reference. Discourse reference is closely tied in with argumenthood, because nominals in regular argument position are taken to introduce full-fledge discourse referents (cf. Longobardi 1994 and much later literature). De Swart & Zwarts (2010) propose the faithfulness constraint FDR to capture the expression of discourse reference:

> FDR: the presence of a discourse referent in the semantics corresponds with an article or other determiner in D.

Languages with a ranking *FUNCTN >> FDR, like Karitiana and Mandarin Chinese freely use bare nominals in regular argument position with discourse referential force. In contrast, languages like French do not allow bare nominals at all in regular argument position, and all nominals, singular and plural as well as mass, need to be marked either with a definite or an indefinite article, indicating a ranking FDR >> *FUNCTN. Given that the definite article introduces familiar or contextually unique/maximal discourse referents, the indefinite article is restricted to contexts in which a new discourse referent is set up. Both definite and indefinite articles satisfy FDR.

Languages like English are in between Chinese and French: bare plurals and bare mass nouns are fine in regular argument position, and have full discourse referential force, as indicated by the fact that they are productively picked up by discourse anaphoric pronouns. But this is not the case for bare singulars in English and in Romance languages. Le Bruyn, de Swart & Zwarts (in progress) propose a restricted version of FDR as FDR_{at}:

> FDR_{at}: the presence of an atomic discourse referent in the semantics corresponds with an article or other determiner in D.

FDR_{at} is motivated by the conceptual salience of atomic individuals, which Farkas & de Swart (2010) ground in psychological literature on the cognitive development of children. The conceptual salience of atomic individuals makes them prime candidates for fulfilling discourse referential functions. In a situation in which some, but not all nominals are marked for discourse referential status, we may expect a contrast between count singulars on the one hand, and mass nouns and plurals on the other. The

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the bare forms *go to church, go to school* (cf. Aguilar Guevara and Zwarts 2010). As far as we can see, all the examples Cyrino & Espinal advance in support of a definite analysis of the BS are cases where definiteness can be derived pragmatically, cf. Pires de Oliveira & Rothstein (2013) for further discussion.

ranking of FDR_{at} >> *FUNCTN works in Brazilian Portuguese as well, and opposes bare plurals (*livros* in 3b) to singular indefinites (*um livro* in 2a).

Under bidirectional optimization, the high ranking of FDR_{at} in BrP implies that bare singulars are not used in regular argument position. Bare singulars appear in predicative position (5a) and the object position of *have* verbs (5b), as it happens in other Romance languages like Spanish and Catalan (see McNally & Espinal 2011):

(5) a. João é *médico*.
João is doctor
'João is a doctor.'
b. Maria teve *carro*.
Maria had car
'Maria had a car.'

There are many analyses of predication on the market, but they all share the intuition that the bare noun in (5a) is not in regular argument position (cf. Longobardi 1994), and predication ultimately involves a property type denotation (Partee 1987). For bare singulars in the object position of a *have* verb in (5b), Cyrino & Espinal (2015) propose a semantic incorporation analysis along the lines of McNally and Espinal (2011), which involves a property type denotation of the bare noun. The examples in (4) are unproblematic for the ranking FDR_{at} >> *FUNCTN if we assume with de Swart & Zwarts (2009) that they involve 'weakly' referential configurations in which FDR is vacuously satisfied for lack of discourse referentiality in the input meaning. The connection between discourse reference and argumenthood thus handles the weakly referential bare singulars in (4), along the same lines as bidirectional optimization accounts for their counterparts in other Romance languages.

Interestingly, though, the bare singular has a wider distribution in BrP than in other Romance languages, as it appears productively in subject position, and the object position of verbs other than *have* verbs, as illustrated by (3a), and examples like (6) (6a,b,c from Cyrino & Espinal, 2015, and 6d,e from Munn & Schmitt 2005):

(6) a. João canta-va *modinha*.
João sing-IMP popular-song
'João sang popular songs.'
b. Vai cair *livro* no chão.
Go.PRES fall book on.the floor
'A book is going to fall on the floor.'[5]

[5] Cyrino & Espinal translate this sentence as 'the book is going to fall on the floor' (example 4c in their paper). As far as we can see, the example involves an

c. O João tem *maçã*. Comprou ∅/*ela/elas* ontem.
the João has apple. Bought ∅/it/them yesterday
'João has an apple/apples. He bought it/them yesterday.'
d. Eu vi *criança* na sala. E ela estava/elas estavam
I see.PERF child in.the room and she was/ they were
ouvindo
listening
'I saw a child/children in the room. And she was/they were listening.'
e. *Criança* lê revistinha.
child read.PRES.3SG comic-book
'Children read comic books.'

BrP bare singulars are productively used in a wide range of full-fledged argument positions, and even have a felicitous generic interpretation in preverbal subject position (6e). They are fully discourse transparent, whether they appear in the object position of a *have* verb (6c) or a verb that does not classify as a *have* verb (6d), and can antecede singular and plural pronouns (6c, d). This makes the BrP bare singular rather different from its counterparts in Spanish or Catalan, and requires an analysis that goes beyond the property denotation found in 'weakly' referential configurations. We take the BrP bare singulars in (6) to be NPs that appear in regular argument position with a well-formed type e denotation due to a type shifting, as proposed by Chierchia (1998) for the BP in English and implemented by Pires de Oliveira & Rothstein (2011) for BrP BSs. But before we can analyze them in bidirectional OT (Section 4), we need to spell out some more details of the number morphology we find in full DP structures.

3. Plurality in bidirectional OT

As a preliminary step for the account of bare singulars and bare plurals in Sections 4 and 5, this section works out the bidirectional OT analysis of the singular/plural contrast in full DPs. Section 3.1 explains why we leave plural indefinite *uns livro(s)* aside in the remainder of this paper. Section 3.2 derives the singular interpretation of unmarked nominals under bidirectional optimization. Section 3.3 analyzes plural agreement within the DP.

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existential construction, and may be true in a situation that is about a particular book (specific indefinite), or about one or several books that were not salient in discourse (non-specific indefinite). We see no support for the definite interpretation of the BS, though.

3.1 Plural indefinites in BrP

The analysis developed so far has focused on the definite article, and the singular indefinite article *um*. But besides the singular indefinite *um livro* (‘a book’), BrP has a plural indefinite *uns livro(s)* (‘some book(s)’), (2b). *Uns* (‘some’) has a counterpart in Spanish *unos*, and Spanish also uses bare plurals next to *unos* plurals. The semantic differences between them are subtle (cf. Le Bruyn 2010 and references therein), and have to do with scope, saliency and polarity: bare nominals tend to take narrow scope with respect to negation (cf. Carlson 1977), but *unos*/*uns* plurals are not restricted in this way, as illustrated for BrP in (7):

(7) a. João não viu uma mancha (no chão).
João not see-PERF.PS ART.IND spot (in+the floor).
‘João didn’t see a spot (on the floor).’
b. João não viu uma-s mancha(s)
João not see- PERF.PS ART.IND.PL spot.(PL)
‘João didn’t see some spots (on the floor).’
c. João não viu mancha.
João not see-PERF.PS spot.
d. João não viu mancha-s
João not see-PERF.PS spot.(PL)
‘João didn’t see spots (on the floor).’

The most prominent reading of (7a) and (7b) is specific (wide scope reading): there was a spot or there were some spots on the floor, which João has not seen. In contrast, (7c) and (7d) are interpreted as negation scoping over the bare phrases: João hasn’t seen any spots. A full treatment of the scopal interpretation of indefinites and bare nominals is beyond the limits of our paper.[6] Although the full plural indefinite (*uns N* (‘some N’)) is related to the BP in BrP, we cannot do justice to the topic in this paper. We think that the presence of *uns* (‘some N’) in the grammar of BrP is not something that can or should be captured by the constraints discussed so far, because this form is driven by other expressive forces, in particular specificity, and quantity information of the kind we find in plural indefinite determiners like *some, several*. The OT grammar developed in this paper does not imply constraints driving these meaning distinctions, so the analysis in Section 5 will not generate the form-meaning pair in (2b), but will be limited to the remaining five examples in (1)-(3).

[6] See Martí (2008) and Le Bruyn *et al.* (2012).

3.2 A singular or mass interpretation for unmarked nominals

Languages with plural morphology restrict the interpretation of unmarked nominals to a non-plural interpretation. English *the book* refers to a singular book, because we use *the books* to refer to an inclusive or exclusive sum of books (Farkas & de Swart 2010), and take *book* to be a count noun. Unmarked nominals can also refer to mass nouns, as in *the oil*. Thus the plural marking on the noun introduces a contrast between plurals on the one hand, and non-plurals (singular or mass) on the other. Sections 4 and 5 will reveal the relevance of mass-like interpretations for unmarked bare nominals in BrP. The biOT analysis is illustrated in Tableau II. This is a partial representation of the grammar, because it ignores the role of the definite article, ignores the distinction between inclusive/exclusive sum interpretations, and only focuses on the presence/absence of plural marking on the noun:

		F-INT	FDEF	FPL	*FUNCTN
(i)	<the N, $\tau x_{at/mass}$ > ✌				*
(ii)	<the Ns, τx_{sum} > ✌				**
(iii)	<the book, τx_{at} > ✌				*
(iv)	<the book, τx_{sum} >			*	*
(v)	<the books, τx_{at} >	*			**
(vi)	<the books, τx_{sum} > ✌				**
(vii)	<the oil, τx_{mass} > ✌				*

Tableau II: bidirectional OT tableau of singular/plural distribution in English

The biOT tableau II evaluates the form-meaning combinations in the second column on the basis of four constraints. FDR_{at} is left out for simplicity. All candidates have at least one violation of *FUNCTN, because of the presence of the definite article. Tableau II is not concerned with possible violations of FDEF (cf. Tableau I), but focuses on the expression and interpretation of plural morphology. The syntactic constraint FPL requires the expression of plural meaning in the form. It is mirrored by the semantic constraint F-INT, which in Tableau II requires interpretation of plural morphology in terms of (inclusive/exclusive) sum reference (cf. Farkas & de Swart 2010).

Candidates (i) and (ii) give the possible form-meaning combinations in the most abstract way: English has definite singulars and mass nouns (i) and definite plurals (ii). Candidates (iii)-(vii) work out examples. F-INT distinguishes the form-meaning pair in (vi) from (v): the use of the plural morphology on *the books* blocks the possibility of an atomic interpretation for this form. FPL distinguishes the form-meaning pair in (vi) from (iv): (iv)

is suboptimal because plurality is not expressed in the form. (vi) is then an optimal form-meaning pair, because syntax and semantics mirror each other in the expression and interpretation of plurality. The unmarked noun in (iii) is left over as the only way to convey reference to atomic definites. Interestingly, the unmarked nominal does not explicitly convey atomicity, for there is no constraint targeting the expression of singularity. Thus, bidirectional optimization accounts for the fact that *the book* refers to a singular book in terms of blocking: the unmarked form is the most economical form, and it assumes the meaning that is not covered by the more specific form it is competing with. The 'elsewhere' interpretation of the unmarked nominals is confirmed by the fact that the same form yields a mass interpretation with appropriate nouns, as in (vii).

In BrP, this blocking mechanism seems to work in a slightly different way. The contrast between (1a) and (1b) is as expected: *o livro* refers to a singular unique book (similar to English *the book*), whereas *os livro(s)* refers to a maximal plurality of books (along with English *the books*). Note that sum reference is marked on the determiner, as well as on the noun in *os livros*, but only on the determiner in *os livro*. A more fine-grained version of this analysis which accounts for plural agreement within the DP is developed in Section 3.3. Note further that the bare plural *livros* in (3b) refers to a plurality of books, but it is not obvious that the unmarked bare nominal *livro* in (3a) refers to a singular book. This issue will be taken up in Section 4.

3.3 Plural agreement within the DP

A more fine-grained cross-linguistic difference within the set of languages marking plurality on the noun resides in the spread of plural marking over different parts of the nominal phrase. In the presence of a numeral, the constraint FPL is satisfied by the determiner, so although Hungarian establishes a difference between singular indefinites (8a), and bare plurals (8b), it does not repeat the plurality conveyed by the determiner in (8c) on the noun, as English does (8d):

(8) a. egy gyerek [Hungarian]
a child
'a child'
b. gyerekek
child-PL
'children'
c. három gyerek
three child
'three children'
d. three children [English]

Farkas & de Swart (2010) analyze the contrast between Hungarian (8c) and English (8d) in terms of agreement. They propose MAXPL as a more fine-grained constraint in the domain of plural marking. MAXPL ('maximize plurality') multiplies plural marking throughout the noun phrase:

MAXPL: Mark with [PL] nouns in a nominal that has sum reference.

Hungarian has the ranking FPL >> *FUNCTN >> MAXPL, which captures the contrast between (8b) (plurality conveyed on the noun) and (8c) (plurality conveyed on the determiner only) (Farkas & de Swart 2010). The Hungarian system is illustrated in Tableau III:

		FPL	*FUNCTN	MAXPL
(i)	<gyerek (child), $\exists x_{sum}$ Child(x)>	*		
(ii)	<gyerekek (children), $\exists x_{sum}$Child(x)> ✌		*	
(iii)	<három gyerek (three child), ∃x: [Child(x) & |Child| ≥ 3]> ✌			*
(iv)	<három gyerekek (three children), ∃x: [Child(x) & |Child| ≥ 3]>		*	

Tableau III: bare plurals and lack of plural agreement on the noun with plural cardinals (Hungarian)

The presence of plural marking on the noun triggers a violation of *FUNCTN. We take plural determiners like cardinals, *some*, etc. to be lexical expressions, so they do not incur a violation of *FUNCTN. The ranking of MAXPL below *FUNCTN implies that plural marking on the noun is perceived as redundant in the presence of a determiner like *három* which lexically conveys plurality, so (iii) is preferred over (iv). However, the ranking of FPL above *FUNCTN requires expression of plurality 'somewhere', so in the absence of an overt D, the Hungarian grammar requires bare plurals rather than bare singulars with plural discourse reference. Thus (ii) is an optimal form-meaning pair along with (iii). In contrast, English adopts the ranking {MAXPL, FPL} >> *FUNCTN, which explains the presence of bare plurals in the grammar, as well as the obligatory presence of a plural noun in the presence of a plural determiner (*three children*).

BrP seems to be in between English and Hungarian in that plural agreement on the noun is optional, as illustrated by the fact that we find both *os livros*/*uns livros* and *os livro*/*uns livro* in (1b), (2b). The same pattern appears with numerals: speakers use *três livros* (three books) alongside *três livro* (three book). In terms of the OT system developed here, the optional agreement patterns indicate that the ranking of the constraint MAXPL with respect to *FUNCTN is vacillating in modern BrP. This is indicative of two parallel grammars, which we correlate in Section 4 with the formal and

informal varieties of BrP. The formal variety displays a full-fledged plural grammar that respects agreement, so we find plural nouns with plural determiners and articles: *os livros, três livros*, etc, just like in English (8d). The informal variety drops the agreement, and uses an unmarked noun with a plural determiner, similar to the Hungarian configuration in (8c): *os livro, três livro*, etc. We take the erosion of plural agreement in the informal register to indicate that the system of plural marking in BrP is undergoing change, and plural marking on the noun is disappearing. This is the second issue we will come back to in Sections 4 and 5.

Summing up, we observe that BrP has a high ranking for FDEF, that is reflected in the use of the definite article in (1). Under bidirectional optimization, this means that the bare nominals in (3) are restricted to a non-definite, existential interpretation (for a few remarks on genericity, see Section 6). The presence of *um* ('a') in (2a) is triggered by a high ranking of the constraint FDR_{at}. Because of the restriction of the FDR constraint to atomic individuals, plurals and mass nouns do not require an article in regular argument position (cf. 3b). We leave the plural indefinite *uns* (some) in (2b) for further research. We think that it cannot (and should not) be accounted for by the constraints under discussion in this paper.

We pointed out two issues for further discussion. The first is that blocking of the plural meaning by an unmarked nominal works as expected under bidirectional optimization for (1a) and (1b), but not for (3a) and (3b). In particular, the unmarked bare nominal in (3a) does not necessarily have a singular meaning in terms of atomic reference. How come? The second issue we raised concerns the plural agreement in (1b) and (2b). We know that the agreement system of BrP is undergoing change, and plural marking on the noun has become optional in configurations like (1b) and (2b). How do we explain this?

In the next sections, we will show that the two issues are connected, but require a slightly different view on the grammar of contemporary BrP. Building on Holt (2003) we will argue that constraint reranking does not only account for (synchronic) language variation, but also for (diachronic) language change. Two historical stages may co exist for a while, especially if they are tied to different registers. The different form-meaning pairs in (1)-(3) are then optimal outcomes of different grammars, related to the formal and informal varieties of BrP, rather than of one single grammar of contemporary BrP. The OT implementation we propose in Section 4 will be connected to existing literature on the semantics of plurality and bare nominals in Section 5.

4. A bidirectional OT grammar of Brazilian Portuguese

The nominal system of contemporary BrP raises important challenges for the cross-linguistic semantics of bare nominals, because definite, indefinite and

bare forms are all productively found in regular argument position. It is strictly impossible to account for these observations with the help of the constraints defined in Sections 2 and 3, as long as we try to derive all the forms within a single bidirectional grammar. Therefore, we propose to change perspective, and abandon the idea of a single grammar of the nominal system of contemporary BrP.

4.1 Two varieties of BrP

We think there are good reasons to relate the co-existence of bare singulars and bare plurals in BrP to different registers. The optional use of plural morphology on the noun in configurations like (1b) and (2b) indicates that the system is undergoing change. The choice between the two forms *os livros* and *os livro* is not free, but driven by internal and external factors (see Schere 1988, among others). Internal factors dictate a preference for the expression of plurality on the left-most expression, which explains why the distinction *os/*o survives, even if the noun loses the plural agreement. Two external factors play a role in the increasing of morphological marks: the degree of education – the higher the degree the more plural marking – and sex – females mark the plural more than males.

Furthermore, there is a general feeling that the formal variety uses bare plurals, whereas the informal variety uses bare singulars. Although, as far as we know there is no systematic research of the distribution of bare noun phrases in written and spoken corpora, it has being claimed that the BS is very frequent in the informal/oral variety, including corpus examples where the BS is used in a definite and specific environment (see Wall 2013 among others). As far as spoken BrP is concerned, Peruchi Mezari (2010) investigated 10 interviews from Varsul, and found very few occurrences of the BP, as shown in the table below: [7]

Table I – Occurrences of Bare Nominals in Corpora

Type	**Number of occurences**	
Bare Mass	17	17,89%
Bare Singular	76	80%
Bare Plural	2	2,102%
Total	**95**	**100%**

The two occurrences of BP found by Peruchi Mezari (2010) are given in (9):

[7] Varsul is a corpus of spoken language from the south of Brazil available at http://www.varsul.org.br/.

(9) a. quer dizer, era-m amigo-s de uma amiga minha.
vant.INF say.INF, be.IMPF-3PP friend-PL of a friend my.
'that is, they were friends of my friend.
(SC FLP 01 F A PRI – L.905)

b. Solta-vam bomba-s de profundidade, essa-s coisa-s.
release-IMPF.3PP bomb-PL of depth, this-PL thing-PL
'they used to release depth bombs, this type of thing'.
(SC FLP 06 M B PRI – L. 71-72)

We observe that the BP in (9a) is in predicative position, as a complement of the verb *ser* ('to be'), but it is not immediately clear to us why plural morphology is used here. The presence of plural morphology in (8b) seems to be motivated by the generic sub-kind interpretation: *bombas de profundidade* (depth bombs) is the type of bombs they used to release. Pires de Oliveira and Rothstein (2011) argue that the BP, but not the BS can get a subkind interpretation. The difference between the number of occurrences of the BS and the BP supports our claim that the BS and the BP belong to different varieties of the language. Our working hypothesis is then that there is a grammar where agreement is obligatory in all the components of the noun phrase; this grammar is associated with the formal variety. And there is a grammar where agreement is not obligatory, which is associated with the informal variety. We correlate these two grammars with the BP and the BS: we hypothesize that the BP is part of the formal variety where agreement is obligatory, whereas the BS belongs to the grammar of the informal variety, where plurality marking is restricted to the left most element (the D).

4.2 The grammar of formal BrP

We propose the co-existence of a formal and an informal variety of BrP, which have different OT grammars. In this section, we work out their corresponding grammars, starting with the full-fledged plural grammar of the formal variety, which has the constraint ranking in (10):

(10) **Formal variety**: {FPL, MAXPL, FDEF, FDR_{at}} >> *FUNCTN.

The OT grammar in (10) is the constraint ranking de Swart & Zwarts (2010) propose for English, Dutch and German. This is also the ranking that is appropriate for European Portuguese, so it provides the link between the two varieties of Portuguese. In order to capture the semantics for bare mass nouns and bare plurals and formal BP, we spell out a partial bidirectional OT tableau for this grammar in Tableau IV. The list of candidates spelled out in Tableau IV is not exhaustive, but the partial tableau indicates the most important features of the grammar of written Brazilian Portuguese.

		F-INT	FPL	FDEF	FDR_{at}	MXPL	*FCTN
(i)	<livro, $\exists x_{at}$>				*		
(ii)	<livro, $\exists x_{sum}$>		*				
(iii)	<água, $\exists x_{mass}$> ✌						
(iv)	<água, ιx_{mass}>			*			
(v)	<um livro, $\exists x_{at}$> ✌						*
(vi)	<o livro, $\exists x_{at}$>	*					*
(vii)	<o livro, ιx_{at}> ✌						*
(viii)	<a água, ιx_{mass}> ✌						*
(ix)	<os livro, ιx_{sum}>					*	*
(x)	<os livros, ιx_{sum}> ✌						**
(xi)	<livros, $\exists x_{at}$>	*					*
(xii)	<livros, $\exists x_{sum}$> ✌						*

Tableau IV: English, European Portuguese, written Brazilian Portuguese

Tableau IV spells out the ranking {FPL, MaxPL, FDEF, FDR_{at}} >> *FUNCTN which BrP shares with European Portuguese, English, etc. A quick look at the optimal form-meaning pairs reveals that a grammar with this constraint ranking produces singular indefinites (*um livro*) (v), singular definites (*o livro*) (vii), definite mass nouns (*a água*) (viii), that have the same grammatical shape as singular definites, and plural definites which exemplify agreement on the noun (*os livros*) (x) in the DP domain.

Bare nominals appear as bare plurals (*livros*) (xii) and bare mass nouns (*água*) (iii). These bare nominals are restricted to an indefinite (existential) interpretation, because of the presence of a definite article in the grammar. The grammar does not produce bare singulars in standard argument position: (i) loses against (v), because of the highly ranked FDR_{at}, which restricts the appearance of bare singulars to 'weakly referential' configurations like predication (cf. example (5a)), incorporation (example (5b)), etc. Note that the variables x in this tableau are taken to have full discourse referential force, so weakly referential configurations are not spelled out here; cf. de Swart & Zwarts (2009) for the intuition that the input in weakly referential configurations does not have discourse referential force, and incurs no violation of FDR_{at}. As long as we look at the written language, BrP is not different from more familiar Romance languages like Spanish, Catalan and European Portuguese.

4.3 The grammar of informal BrP

We observed in Section 4.1 that BrP is undergoing important changes in the morphological system. In particular, informal BrP is losing plural morphology on the noun. We correlate erosion of plural agreement on the

noun in full DPs with demotion of MAXPL. The reordering of MAXPL below *FUNCTN restricts the expression of plurality to a single realization within the noun phrase. Given that indefinite determiners like *many* and numerals like *two, at least three, exactly four*, etc. inherently convey plurality as part of their lexical semantics, this erosion will affect agreement of plurality on the noun, rather than on D. The order *FUNCTN >> MAXPL generates forms like *os livro* (the-PL book), *três livro* (three book), as illustrated for Hungarian in Tableau III above. In contrast, the forms *os livros* (the-PL book-PL), *três livros* (three book-PL) are found in the formal variety (cf. Tableau IV). The ranking of MAXPL below *FUNCTN captures Schere & Naro's (1997) claim that plurality is by default marked at the left-most component of the noun phrase.

However, the lowering of MAXPL is not sufficient to derive BSs in informal BrP. The data in Table I suggest that the BP is essentially lost in the spoken language, so we take the informal variety not to generate bare plurals at all. It would be tempting to take this to imply that FPL is also demoted, and informal spoken BrP has the ranking *FUNCTN >> {MaxPL, FPL}. This, however cannot be correct, as the ranking of FPL below *FUNCTN would predict the loss of the singular plural distinction in the definite article: instead of the morphological contrast between *o livro* (the book) and *os livro* (the-PL book), we would expect one definite article that neutralizes the singular/plural contrast in favor of economy. But native speaker intuitions yield categorical judgments here: *o livro* means 'the book' (atomic reference), and cannot refer to multiple books. Sum reference strictly requires the use of *os* (the-PL).

We conclude that erosion of number distinctions affects the N, but not the D in informal, spoken BrP. It is quite possible that the language will develop further, and end up with demotion of FPL. However, that is not its current stage, so we have to maintain the ranking FPL >> *FUNCTN, even for the informal variety.

The situation then looks very similar to the inverse marking cases de Swart & Zwarts (2010) discuss. English has a regular singular/plural contrast on the noun, which correlates with the ranking FPL >> *FUNCTN. Yet, there are many nouns that do not have distinct singular and plural forms. This happens with isolated cases like *sheep*, but also more regularly with certain classes of nouns, e.g. those for exotic people groups, animals that are hunted or fished on, and deadjectival human terms. Notice how the subjects in the following examples behave as plurals (triggering plural agreement on the verb), without being morphologically marked as such:

(11) a. The Carib were noted for their ferocity
b. Carp breed from May to July
c. The Chinese are subsidizing the American way of life

Across languages, there are many such examples of general markedness patterns, with local exceptions where the pattern is neutralized or even reversed (as in languages with a general plural marker, but singular markers for certain noun classes). The phenomenon of inverse markedness is well known in typology (cf. Tiersma 1982, Haspelmath 2006). De Swart & Zwarts (2010) maintain that it can be handled in Optimality Theory by means of a combination of general and local constraints. For English, they propose the ranking FPL >> *FUNCTN in combination with the ranking *$PL_{FISH/NAT}$ >> FPL to derive the use of the unmarked noun *carp, Chinese* rather than plural marked **carps* or **Chineses* in (11b) in a language that otherwise has a productive singular/plural distinction. The OT account of inverse markedness is illustrated in Tableau V:

	*$PL_{FISH/NAT}$	FPL	*FUNCTN
<carp, $\exists x_{sum}$ carp(x)> ✌		*	
<carps, $\exists x_{sum}$ carp(x)>	*		*

Tableau V: unmarked plural in English

*$PL_{FISH/NAT}$ can be seen as a very specific instance of the general markedness constraint *FUNCTN, which in English has moved upwards in the constraint ranking, but in other languages has remained included in *FUNCTN.

For BrP, we propose a similar strategy, and propose a constraint *PL_N to capture the generalization that plurality is not expressed at all on nouns. This is a stricter interpretation of Schere & Naro's (1997) claim that plurality is by default marked at the left-most component of the noun phrase. In fact, we take singular/plural distinctions in informal BrP to be inoperative at the NP level, and realized exclusively at the DP level. The idea that *PL_N is a specific instance of the general markednessconstraint *FUNCTN makes it possible to hypothesize that the high ranking of *PL_N is potentially a precursor of the constraint FPL falling below *FUNCTN. The ranking *PL_N>> FPL >> *FUNCTN can then collapse into *FUNCTN >> FPL at a later stage of the diachronic development of BrP. At this point in time, we cannot predict if and when this will happen.

We propose the constraint ranking for informal spoken BrP in (12):

(12) **Informal spoken BrP**:
*PL_N >> {FPL, FDEF, FDR_{at}} >> *FUNCTN >> MAXPL.

This ranking might be specific to grammars that are undergoing erosion, because it seems to indicate that the grammar is hanging on to singular/plural distinctions on the article where the rest of the nominal phrase does no longer

grammaticalize them. We leave the typological/diachronic implications of this observation open for further study, and will restrict ourselves here to BrP. The bidirectional grammar of informal spoken BP is depicted in Tableau VI.

The grammar in Tableau VI maintains the singular/ plural distinction with definite articles, and generates singular (atomic) *o livro* (v) (the book) next to the plural *os livro* (the-PL book) (viii). Definite mass nouns take the same grammatical shape as definite singulars, so we find *a água* (vi) next to *o livro* (v) in contrast to the plural *os livro* (viii). Note that there is no plural agreement on the noun in the spoken variety, because of the ranking of MAXPL below *FUNCTN, so *os livro* is the optimal outcome in Tableau VI, in contrast to *os livros* in Tableau IV. It is quite possible that the grammar in Tableau VI will further erode in the next decades, but as long as the distinction between *o* (the-SG) and *os* (the-PL) (and *um* (a) and *ums* (some)) is clearly felt to be relevant by native speakers, the next step in the decaying expression of plurality might take a long time.

		F-INT	*PL_N	FDEF	FDR_{at}	FPL	*FCTN	MXPL
(i)	<livro,$\exists x_{at}$>				*			
(ii)	<livro,$\exists x_{sum}$> ✌					*		
(iii)	<agua,$\exists x_{mass}$> ✌							
(iv)	<um livro, $\exists x_{at}$> ✌						*	
(v)	<o livro, ιx_{at}> ✌						*	
(vi)	<a água, ιx_{mass}> ✌						*	
(vii)	<o livro, ιx_{sum}>					*	*	*
(viii	<os livro, ιx_{sum}> ✌						**	*
(ix)	<os livros, ιx_{sum}>		*				***	
(x)	<livros, $\exists x_{sum}$>		*				*	

Tableau VI: informal Brazilian Portuguese

Given the restriction on the expression of plurality to the D domain induced by *PL_N, BPs are not generated in this grammar (x), but BSs are (ii, iii). FDR_{at} requires marking of atomic reference, so the BS is in competition with the singular indefinite. Under bidirectional optimization, the BS ranges over non-atomic discourse referents (either plural or mass (ii, iii)). Even though informal BrP maintains the high ranking of FPL, the even higher ranking of *PL_N leads to a situation in which indefinite mass nouns and indefinite plurals have the same grammatical shape of BS. Obviously, the BS appears in weakly referential configurations as well, just like in the other variety of BrP, so this analysis accounts for the full range of data about BS in object position in Cyrino & Espinal (2015).

4.4 Intermediate conclusions

Summarizing, we posit two grammars co-existing in BrP today, but suggest that they reflect different stages in an ongoing process of language change. The traditional grammar inherited from European Portuguese generates bare mass nouns and bare plurals with an existential interpretation, just like English. Informal BrP drops the agreement *–s* on the noun in full DPs with a plural determiner with inherently plural determiners like *many* or numerals. Definites preserve the singular/plural distinction at the article level (*o*/*os*), but drop the agreement on the noun, leading to a contrast between *o livro* (the book) and *os livro* (the-PL book).

The low ranking of MAXPL under *FUNCTN in the informal variety restricts the expression of plurality to the domain of determiners. The local constraint $*PL_N$ banishes plural morphology on the noun, and generates bare singulars instead of bare plurals for discourse reference with sum reference. But the introduction of $*PL_N$ does more: it rearranges the grammar in the sense that number distinctions are no longer visible on the N (or NP). However, informal spoken BrP maintains a high ranking for the constraint FDR_{at}. Thus atomic discourse referents require a full DP structure, reflected in the definite article *o* and the indefinite article *um*. The effect of the ranking $*PL_N$ >> {FDR_{at}, FDEF, FPL} >> *FUNCTN >> MAXPL is that the grammar establishes a distinction between plural and non-plural (atomic/mass) definites, along with a distinction between atomic and non-atomic (mass/plural) indefinites.

Under the bidirectional OT grammars spelled out for the two varieties (and diachronic stages) of BrP in Tableaux IV, and VI, the BP and the BS are not in direct competition. The different rankings have important implications for the semantics of bare nominals in BrP: Tableau IV treats the BP as an indefinite plural, and Tableau VI treats the BS as an indefinite noun phrase that can have either a mass or a plural interpretation. Section 5 places the implications of the two different grammars in the context of the ongoing debate on the semantics of bare nominals in BrP.

5. The semantics of bare nominals in BrP

5.1 Exclusive and inclusive plurality in BrP

The difference between the BS and the BP, exemplified in (3a) and (3b), and repeated in (13a) and (13b) has often been related to different notions of "plurality" (Schmitt & Munn (1999, 2002), Müller (2002)):

(13) a. compr-ou *livro*.
buy-PERF.PS book

b. compr-ou *livro-s*.
buy-PERF.PS book-PL
'bought books.'

Descriptively, (13a) is true in a situation where one or more books were bought. In contrast, (13b) seems to be true only if the quantity of books is greater than one. For Schmitt & Munn (1999, 2002), the BS is number neutral (no number projection in the DP structure), and the BP is derived from a number projection where the feature plurality is active. Müller (2002) also argues that the BS is number neutral, i.e. it denotes atoms and sums, whereas the BP only denotes pluralities.

The notion of number neutrality is closely related to that of inclusive plurality. The recent literature on plurality (Sauerland *et al* 2005, Farkas & de Swart 2010) argue that, semantically, the plural in English is inclusive (against Chierchia 1998 among others), and exclusiveness is derived via an implicature. An exclusive plural refers to a group that only involves pluralities, i.e. it ranges over sum individuals and excludes atoms. An inclusive plural refers to a group that allows both atomic and sum individuals. In this perspective, the BS and the BP are both plural predicates: the BS has inclusive sum reference, and the BP is exclusive (Mattoso Câmara Jr 1997).

If exclusiveness is a semantic feature of the plural morpheme in BrP, then sum reference is not cancelable, and negation of the BP should lead to a strong reading under which (14) conveys that João has bought a single book (cf. Martí 2008):

(14) O João não comprou livro-s.
The João not buy.PRES.3SG book-PL
'João didn't buy books.'

Prosodic marking of the BP in (14) allows a metalinguistic negation denying that João's situation is characterized as one where he has not bought books, because he has bought just one. However, the sentence conveys more naturally that João didn't buy any books. The reading where he has bought no books is unexpected if BPs have strictly exclusive sum reference.

The use of the BP in a question or as the antecedent of a conditional confirms that the BP does not convey exclusive plurality:

(15) a. Você viu cavalo-s no pasto?
You see.PERF.3SG horse-PL in+the meadow
'Did you see horses in the meadow?'
b. Se você viu cavalo-s no pasto, por favor me diz.
If you see.PERF.3SG horse-PL in+the meadow, please me say
'If you saw horses in the meadow, please say so.'

Spotting one horse in the meadow is enough to give a positive answer to (15a), or trigger a positive response in (15b).

Although the plural morpheme denotes an inclusive plurality, both in English and in BrP, it is felicitous only in situations where sums are potentially present in the background. This is why the BP is unlikely in (16b), as pointed out by Farkas & de Swart (2010) for English. The authors claim that: "a plural is always odd when sum values are pragmatically excluded from its domain of reference" (p. 3). Accordingly, (16a) is the most natural way of expressing that João obtained his driver's license:

(16) a. O João tir-ou carteira de motorista
the João take-PERF.PS license of driver.
'João took the driver's license.'
b. O João ti-rou #carteira-s de motorista.
the João take- PERF.PS license-PL of driver.
'João took driver's licenses.'

If we follow Farkas & de Swart's reasoning, the BrP BP denotes an inclusive plural, just like the English bare plural. In contrast, the BS does not denote in the plural domain, because the BS is compatible with atomic interpretations, as illustrated in (16a). The BS seems to parallel the indefinite singular in English in such contexts. But this cannot be the full story, for the BS can antecede a singular as well as a plural discourse pronoun, as illustrated in (6c). It is thus not restricted to an atomic interpretation. Moreover, the high ranking of FDR_{at} should trigger the presence of the indefinite article *um* in BrP if the speaker really intends to introduce an atomic discourse referent (cf. Section 4).

This can indicate one of two things: either the OT system set up so far does not work, or at least not for bare nominals in BrP. Or there is more to say about the semantics of the BS and the BP. Before we give up the OT enterprise too quickly, it is worth exploring the second route. More precisely, we want to explore the possibility that the BP are truly interpreted as plurals, whereas BS are interpreted as non-atomic (either mass or plural).

5.2 A mass interpretation for the BS

Section 5.1 explored the possibility that a number-neutral interpretation of the BS is related to the distinction between inclusive and exclusive plurality. However, there is no empirical support for the hypothesis that the BP has exclusive sum reference, rather, we established that it has inclusive sum reference. Accordingly, we need to explore a different route to explain the intuition that the BS can refer to both sums and atoms. The alternative Pires de Oliveira & Rothstein (2011, 2013) explore is the view that the semantics

of the BP builds on number and denotes a true plural, while the BS does not have access to atoms.

Pires de Oliveira & Rothstein propose that the BP is derived from a plural predicate, which is built from a predicate that has semantic atoms, in line with Rothstein's (2010) proposal. In contrast, the BS is built from the root noun. Root nouns are structures that may be differently organized because the atoms are vague; i.e. they may be contextually fixed. So crucially, the plural predicate is derived from semantic atoms, whereas the BS is derived from a non-atomic structure. If root nouns do not have access to semantic atoms, we might expect BSs to display the grammatical behavior of mass nouns. Empirical support for this hypothesis comes from the contrast in (17):

(17) a. João com-eu maçã.
João eat-PERF.PS apple
b. João com-eu maçã-s
João eat-PERF.PS apple-PL
'João ate apples.'

Suppose that João is sick and he has eaten just a couple of small pieces of apple today. (17a) can be used to report such a situation, (17b) cannot. So in the object position of episodic predicates, the BS is felicitous in a situation that involves pieces or portions of individuals, whereas the BP is inadequate in such situation.

A strong argument in favor of the mass-like interpretation of the BS comes from the domain of comparison. Pires de Oliveira & Rothstein's (2011, 2013) argue that there is a difference in interpretation between (18a) and (18b):

(18) a. João compr-ou mais maçã do que Maria.
João buy-PERF.PS more apple of+the than Maria.
b. João compr-ou mais maçã-s do que Maria.
João buy- PERF.PS more apple-PL of+the that Maria.
'João bought more apple/apples than Maria.'

Imagine a situation where one buys apples by weight: $5 per kilo. Suppose that João bought 3 large apples whereas Maria bought 6 small ones. Sentence (18a) can be used in such a situation to convey that the weight of the apples that João bought is greater than the weight that Maria bought. (18b) cannot be used in such a situation. The only interpretation for (18b) is that the number of apples that João bought is greater than the number of apples that Maria bought; an interpretation that is false in the described situation. According to Pires de Oliveira & Rothstein (2011), the non-atomic structure of the BS allows for comparisons along different scales (volume,

weight, cardinality,…), whereas the BP, because it is built from semantic atoms, must bear on the number of individuals.

Beviláqua & Pires de Oliveira (2014) report the results found in Beviláqua (2015) of two experiments on the mass and count readings of the BS and the BP. The experiment relies on Bale & Snedecker's (2005) methodology for quantity elicitation. Participants heard stories which biased the answer towards a count or a mass context. Then, they heard a 'who has more N' question where N was replace by BS, BP, mass nouns; for instance: *Quem tem mais bola?* (who has more ball?), *Quem tem mais bola-s?* (who has more balls?). The task was to choose between two situations, presented using pictures: in one of the situations, the character has more individuals with less volume; in the other picture, a different character has less individuals that are greater in volume.[8] The results show that the BP is always interpreted by comparing the units of individuals, even when the context is biased towards a mass interpretation. There is no significant difference of behavior of the BP in the count and mass contexts: it is always compared by the number of individuals. On the other hand, in the mass context, for BSs, participants based their quantity judgments on volume significantly more, despite the number of individuals being greater (60,94% vs 20,31%). The "chi-square goodness-of-fit" test is statistically highly significant: $\chi 2(2) = 21.96$, $p = 0.000$ ($p < .005$): participants are interpreting the BS by volume (it is not a random effect). The BP, in the same context, is interpreted by the number of individuals.

We conclude that there is both theoretical and experimental evidence in favor of the mass interpretation of the BS.

5.3 A non-atomic interpretation of the BS

The experiment carried out by Beviláqua (2015) reveals that the BP is restricted to a count interpretation, but that the BS can have both a count and a mass interpretation. Thus, both (18a) and (18b) can be used in a situation where João has more units of apple than Maria. Since the BS is built from a lattice with vague atoms in the analysis developed by Pires de Oliveira and Rothstein (2011, 2013), any partition is allowed, including one that takes individuals that count as one as unity. We build on this result with our hypothesis that the BrP BS has a non-atomic meaning which subsumes both mass and plural interpretations. This hypothesis requires evidence in favor of the plural semantics of the BS on top of the evidence in favor of a mass interpretation in Section 5.2. One argument comes from the presence of reciprocals and other anaphoric expressions that depend on a plural

[8] The experiment can be found at www.roberta.neg.cce.ufsc.br

antecedent, like (19) (from Schmitt & Munn 1999 and Munn & Schmitt 2005):

(19) a. Criança briga uma com a outra.
child fights one with the other.
'Children fight with each other.'
b. Elefante anda um atrás do outro.
elephant walk-PRES.3SG one behind of.the other.
'Elephants fall down one after the other.'

Another argument comes from the licensing of plural discourse anaphora by BSs. Mass nouns, even *furniture* nouns antecede singular discourse pronouns, as illustrated in (20):

(20) We bought furniture in Beijing and shipped it/*them to Hong Kong.

If the BrP BS has both mass and plural interpretations, we expect it to license both singular and plural discourse pronouns. The variability in pronominal anaphora has already been illustrated in (6c,d), repeated here as (21):

(21) a. O João tem *maçã*. Comprou ∅/*ela/elas* ontem.
the João has apple. Bought ∅/it/them yesterday
'João has an apple/apples. He bought it/them yesterday.'
b. Eu vi *criança* na sala. E *ela* estava/*elas* estavam
I see.PERF child in.the room and she was/ they were
ouvindo.
listening
'I saw a child/children in the room. And she was/they were listening.'

The singular pronoun is expected under the mass-like interpretation, where the pronoun picks up on the instantiation of the concept. The plural pronoun picks up on the plural interpretation of the BS. The covert pronoun may remain the preferred way to pick up the BS, because it remains neutral between the mass and the plural interpretation. One prediction this accounts makes is that singular pronouns should be dispreferred with higher animate nouns, because they are not easily conceived as mass. We leave the experimental testing of this prediction for further research.

In summary, two issues that cross in the description of the differences between the bare singular and the bare plural are very relevant to our account of the distribution and interpretation of noun phrases in BrP. (i) Only the bare plural requires that there is at least one world where sums are involved. We call this property sensitivity to plurality, and account for it by deriving only

(inclusive) sum reference for the BP in Tableau IV. (ii) Only the bare singular allows for comparison by cardinality as well as other scales (weight, or other). The non-atomic semantics of the BS unifies a number of key insights about bare nominals and number that have been advanced in the literature on BrP.

6. Concluding Remarks

The two biOT grammars developed in this paper reflect a language in change, where BSs and BPs are not in direct competition. The analysis has focused on BS in the object position of episodic predicates, because it aimed at an account of the contrasts between definites (1), indefinites (2) and bare nominals (3). However, a substantial amount of the literature on BrP bare nominals is devoted to their restrictions on use and interpretation in subject position, and emphasizes kind reference and genericity. How can we extend our analysis to deal with the examples in (22) (from Müller 2002)?

(22) a. O brasileiro é trabalhador.
the.MASC.SG Brazilian be.3PS.PRES hardworking
'Brazilians are hardworking.'

b. Os brasileiro-s são trabalhador-es
the.MASC.PL Brazilian-PL be.3PP.PRES hardworking-MASC.PL
'Brazilians are hardworking.'

c. Brasileiro é trabalhador.
brazilian be.3PS.PRES hardworking

d. Brasileiro-s são trabalhador-es.
Brazilian.PL be.3PP.PRES hardworking-MASC.PL
'Brazilians are hardworking.'

Although a full analysis of genericity in BrP is clearly outside the scope of this paper, a few remarks are in order. From the perspective adopted in this paper, it is relevant to observe that (22c) and (22b, 22d) belong to different registers of the language: (22c) may be found in informal spoken BrP, along with (22a) and (22b) (albeit with the reduced form *os brasileiro*), while (22d) is restricted to written BrP. Under the analysis developed in this paper, the BS and BP are not in direct competition, and the mass-like interpretation of (20c) may well explain the impossibility to assign the BS a taxonomic interpretation, in contrast to the BP in (22d), which is inherently plural and thus provides access to subkinds (cf. Pires de Oliveira & Rothstein 2011).

Beyond this preliminary observation, the data in (22) raises an important question: why are BSs in subject position restricted to generic interpretations, while BPs are not? Consider (23) (from Pires de Oliveira & Rothstein 2011):

(23) a. Bombeiro-s estão disponível-s. (GEN OR ∃)
fireman-PL be.PRES.3PL available-PL.
'Firemen in general are available.' OR
'Some firemen are available.'
b. Bombeiro está disponível. (ONLY GEN)
fireman be.PRES.3SG available.
'Firemen in general are available.'

While BPs with stage-level predicates are ambiguous between a generic or an existential reading (23a), BSs can only get a generic reading in this environment (23b). As Pires de Oliveira & Rothstein show, the same contrast is found with individual-level predicates like *inteligente* ('intelligent') or the object position of predicates like *gostar* ('like'). This seems to indicate that there are deeper differences between the BrP bare plural and the English bare plural than our grammar has accounted for so far.

Kester & Schmitt (2007) claim that BrP bare plurals can have a specific interpretation, lacking for their English counterparts. But the BS in (23b) also behaves in a different way from its English counterpart, as sentences involving mass nouns do allow both generic and existential readings:

(24) a. Moss grows behind the garden shed. (existential OR generic)
b. Furniture gets damaged en route. (existential OR generic)

The beginnings of an answer may be found in Cyrino & Espinal (2015), who point out that the BSs in (22c) do not get a 'weak' (existential) reading, but require a 'strong' (generic, focused, pair-list) reading. If the preverbal position in BrP is indeed a topic position, as they claim, either a generic or a specific interpretation would be available for the BP in (22d). For lack of a specific reading, the BS in (20c) would be restricted to a generic interpretation. More empirical and theoretical details are needed to spell out this route, but in principle it is a viable option to treat the generic interpretation of the BS in (22c) as the 'strong' reading of non-atomic nominals.

We conclude that a full account of Brazilian bare nominals in preverbal position requires a more in depth investigation that goes beyond the scope of this paper, but that the data and observations made in the literature are not incompatible with the proposals made in this paper.

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